

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A system for use in navigating an implantation of a ~~selected construct~~ human spinal implant, comprising:

a first pedicle screw member and a second elongated rod member of the construct adapted to selectively interact with each other after implantation and said first pedicle screw member operable to be fixed into a boney structure;

a third pedicle screw member positionable relative to said first pedicle screw member and said second elongated rod member in an anatomical portion;

a first localization element selectively and removably fixed to said first pedicle screw member ~~[[and]]~~ having a depressible member to operate an internal mechanism to engage and disengage from said first pedicle screw member;

a second localization element selectively and removably fixed to said second elongated rod member;

a detector to detect said first localization element and said second localization element when said first localization element and said second localization element is ~~associated with~~ selectively fixed to at least one of said first pedicle screw member or said second elongated rod member; and

a processor configured to:

assist in navigation of said second elongated rod member relative to said first pedicle screw member;

receive position information for all of said first pedicle screw member, said second elongated rod member, and said third pedicle screw member from said detector;

determine a relative position between all of said first pedicle screw member, said second elongated rod member, and said third pedicle screw member;

assist in navigation of said third pedicle screw member relative to at least one of said first pedicle screw member or said second elongated rod member ~~in a substantially patient imageless manner~~ including generating icons for display on a display device without patient image data displayed on the display device; and

simultaneously track said first localization element while selectively fixed to said first pedicle screw member while tracking and said second localization element while selectively fixed to said second elongated rod member.

2. (Currently Amended) The system of claim 1, wherein said first pedicle screw member includes a fastener operable to be fixed to a selected anatomical portion having a first fixable portion for being fixed to the selected anatomical portion and a second engageable portion to be connected to said second elongated rod member;

wherein said second elongated rod member includes a connector to operably interconnect said first pedicle screw member and ~~[[the]]~~ said third pedicle screw member.

3. (Currently Amended) The system of claim 2, wherein said third pedicle screw member is selected from a group including a fastener, a connector, an anatomical portion, and combinations thereof.

4. (Previously Presented) The system of claim 1, wherein said first pedicle screw member and said second elongated rod member are each fasteners having a fastener portion and an engageable portion;

wherein said third pedicle screw member is a connector operable to interconnect said first pedicle screw member and said second elongated rod member in a selected orientation.

5. (Previously Presented) The system of claim 1, wherein said localization element is selected from a group comprising an electromagnetic tracking device, an optical tracking device, a conductive tracking device, a fiberoptic tracking device, an acoustic tracking device, and combinations thereof.

6. (Original) The system of claim 1, wherein said detector is selected from the group comprising an electromagnetic detector, an optical detector, a conductive detector, a fiberoptic detector, an acoustic detector, and combinations thereof.

7. (Previously Presented) The system of claim 1, wherein said first localization element includes an extender operable to be removably connected to said

first pedicle screw member; and a first tracking element operable to be detected by said detector to detect a position of said first tracking element in a detector space; and said second localization element includes an extender operable to be removably connected to said second elongated rod member and a second tracking element operable to be detected by said detector to detect a position of said second tracking element in detector space.

8. (Previously Presented) The system of claim 7, wherein said processor is operable to determine a position of at least one of said first pedicle screw member or said second elongated rod member after detection of said tracking element by said detector.

9. (Original) The system of claim 7, wherein said localization element includes a plurality of localization elements such that each of said first pedicle screw member and said second elongated rod member includes a localization element extending therefrom.

10. (Canceled)

11. (Previously Presented) The system of claim 1, further comprising:
a fourth member;

wherein said first pedicle screw member, said second elongated rod member, and said third pedicle screw member are operable to be fixed relative to the anatomical portion;

wherein said processor is operable to determine a real time position of said fourth member relative to said first pedicle screw member, said second elongated rod member, and said third pedicle screw member to substantially position said fourth member in a selected position relative to said first pedicle screw member, said second elongated rod member, and said third pedicle screw member.

12. (Previously Presented) The system of claim 1, wherein said second elongated rod member is substantially navigated at least one of percutaneously or minimally invasively.

13. (Canceled)

14. (Currently Amended) The system of claim 1 further comprising:
a navigable needle positionable relative to at least one of said first pedicle screw member or said second elongated rod member such that said navigation system is operable to determine a position for the third member relative to said of at least one of said first pedicle screw member or said second elongated rod member.

15. (Currently Amended) The system of claim 1, wherein said processor assists in providing an alignment of said of at least first pedicle screw member or said second elongated rod member in at least two planes.

16. - 17 (Canceled)

18. (Currently Amended) The system of claim 17, wherein said ~~connector~~ second elongated rod member is selected from a group comprising a substantially rigid rod, a steerable connector, a deformable connector, a flexible connector, and combinations thereof.

19. (Canceled)

20. (Currently Amended) The system of claim 1, wherein said display displays a representation of at least one of said first pedicle screw member or said second elongated rod member with an icon.

21. (Currently Amended) The system of claim 20, wherein said display displays an atlas map superimposed over said ~~icons of said at least first member or said second member~~ icon.

22. (Currently Amended) A system for use in determining a position of a first implantable member and planning and navigating relative to the first member for positioning a second member to interact with said first member, the system comprising:

the first member including a bone engaging portion for fixation to a boney structure;

a tracking element interconnected with the first member operable to be used to determine a position of the first member;

a first detector to detect said tracking element;

a processor to determine a position of the first member depending upon the detection of said first detector;

a navigable instrument operable to move the second member relative to the first member; [[and]]

a second detector to detect said navigable instrument; and

a display to display a first icon representing a first location of the first member and a second icon representing a second location of the second member;

wherein the tracking element remains connected to the first member during the movement of the navigable instrument;

wherein said processor is configured to determine a position of the second member relative to the first member in at least two planes;

wherein said processor is configured to navigate said navigable instrument relative to said tracking element for positioning of the second member relative to the first member in a substantially patient imageless display; and

wherein said processor is configured to track the tracking element fixed to said first member while tracking said navigable instrument;

wherein the substantially patient imageless display includes said first icon and said second icon representing the first member and the second member in the at least two planes with no displayed images of the patient.

23. (Original) The system of claim 22, wherein said first detector and said second detector are a single detector.

24. (Previously Presented) The system of claim 23, wherein said detector is selected from the group comprising an electromagnetic detector, an optical detector, a conductive detector, a fiber optic detector, an acoustic detector, and combinations thereof.

25. (Original) The system of claim 22, wherein said navigable instrument is operable to engage the second member to move the second member relative to the first member.

26. (Previously Presented) The system of claim 22, wherein said processor is operable to navigate said navigable instrument relative to said tracking elements such that said second member is moved to a selected position relative to said first member substantially at least one of percutaneously or minimally invasively.

27. (Previously Presented) The system of claim 22, further comprising:

an imaging device to acquire a patient image after the first member and the second member are navigated in the substantially patient imageless manner of a selected portion relative to at least one of the first member or the second member and to display the acquired image data relative to said first icon and said second icon representing the first member and the second member to confirm the displayed position of at least one of the first member or the second member.

28. (Previously Presented) The system of claim 22, wherein said processor provides an alignment along at least two planes relative to the first member or the second member.

29. (Currently Amended) The system of claim 28, wherein said planes are substantially orthogonal including a view along a longitudinal axis of the first member and a view transverse to the longitudinal axis of the first member.

30. (Currently Amended) The system of claim 22, wherein said processor determines the position of the first member and the second member ~~in a substantially~~ without images of the patient-imageless manner.

31. (Original) The system of claim 30, further comprising:

a display to display a first icon to represent a position of the first member and a second icon to represent a position of the second member relative to said first member.

32. (Original) The system of claim 31, wherein said processor superimposes an atlas model over the first icon and the second icon.

33. (Currently Amended) A method of implanting a construct having at least a first member, a second member, or a third member, the method comprising:

- positioning the first member into a first boney structure;
- tracking a position of the first member in a selected space with a first tracking element connected to the first member;
- positioning the second member in a second boney structure relative to the first member;
- tracking a position of the second member in the selected space with a second tracking element connected to the second member while positioning the second member relative to the first member;
- navigating the third member relative to the first member and the second member, while tracking the first tracking element connected with the first member and tracking the second tracking element connected to the second member, including:
 - determining with a processor a real time optimal position of the third member in the selected space; and
 - determining a real time position of the third member relative to at least one of the first member or the second member;
- displaying an icon on a display to illustrate the determined real time optimal position of the third member; and
- displaying an icon to represent the position of at least two of the first member, the second member, or the third member without displaying images acquired of the patient on the display in a substantially patient imageless manner.

34. (Previously Presented) The method of claim 33, further comprising saving at least one of the determined position of the first member or the determined position of the second member.

35. (Canceled)

36. (Original) The method of claim 35, wherein said tracking element is selected from a group comprising an electromagnetic tracking device, an optical tracking device, a conductive tracking device, a fiber optic tracking device, an acoustic tracking device, and combinations thereof.

37. (Currently Amended) The method of claim ~~[[35]]~~ 94, further comprising determining a selected alignment relative to said determined position of the first member and said determined position of the second member.

38. (Previously Presented) The method of claim 37, further comprising:
selecting a characteristic of at least one of the first member, the second member or the third member from a group including a length, a radius, a diameter, an offset, a flexibility, an alignment, or combinations thereof.

39. (Currently Amended) The method of claim ~~[[33]]~~ 38, further comprising:

verifying a final position of the third member relative to at least one of the first member or the second member.

40. (Previously Presented) The method of claim 39, wherein verifying the position of the third member includes obtaining an image of an area including at least one of the first member or the second member and said third member.

41. (Original) The method of claim 33, further comprising:
displaying the determined real time position of said third member on a display;
wherein said display assists a user in moving the third member relative to the optimal position.

42. (Original) The method of claim 33, further comprising:
selecting a characteristic of the third member for implantation relative to the first member and the second member; and
positioning a fourth member relative to said first member and said second member to be interconnected by said third member in the selected orientation.

43. (Currently Amended) The method of claim ~~[[33]]~~ 94, wherein determining a real time optimal position includes processing with a processor regarding at least two planes a determination of ~~determining~~ a real time optimal position along at least two planes for the third member.

44. (Currently Amended) The method of claim 43, wherein said two planes are substantially orthogonal to each other including displaying on a display device a first icon representing a top view of the elongated rod and displaying a second icon representing a side view of the elongated rod.

45. (Currently Amended) The method of claim ~~[[33]]~~ 94, further comprising:

determining a contour of a soft tissue without patient images by tracking an instrument that is moved relative to the soft tissue ~~relative to at least one of the first member, the second member, or the third member;~~

wherein determining a real time optimal position includes determining an insertion point through the soft tissue for the ~~third member~~ elongated rod.

46. (Currently Amended) The method of claim 45, wherein determining a contour of the soft tissue includes moving a navigable probe ~~relative to~~ that is tracked and contacting the soft tissue to determine a contour of the soft tissue relative to the boney structure with a processor for determining the insertion point.

47. (Previously Presented) The method of claim 33, wherein positioning the first member, positioning the second member, and navigating the third member includes at least one of percutaneous or minimally invasively placements of at least one of a pedicle screw or a connector.

48. (Previously Presented) The method of claim 47, wherein navigating the third member includes at least one of percutaneously or minimally invasively moving the third member relative to the first member and the second member to interconnect the first member and the second member.

49. (Canceled)

50. (Previously Presented) The method of claim 33, wherein at least one of determining a position of the first member or determining a position of the second member includes associating a trackable probe to at least one of the first member or the second member.

51. (Canceled)

52. (Previously Presented) The method of claim 33, wherein determining a real time position of the third member includes knowing substantially only the position of the third member relative to at least one of the first member or the second member.

53. (Currently Amended) A method of implanting a construct of at least a first member, a second member, or a third member substantially at least one of percutaneously or minimally invasively, comprising:

selecting a final orientation of at least one of the first member, the second member, or the third member relative to at least one other of the first member, the second member, or the third member to interconnect vertebra;

tracking a position of the first member while tracking a position of the second member in order to provide a dynamic reference frame;

displaying said position of each of ~~[[said]]~~ the first member and the second member as two or more icons on a display;

selecting a characteristic of at least one of ~~[[said]]~~ the first member, ~~[[said]]~~ the second member, or ~~[[said]]~~ the third member;

navigably positioning at least one of ~~[[said]]~~ the first member, ~~[[said]]~~ the second member, or ~~[[said]]~~ the third member relative to another of at least one of ~~[[said]]~~ the first member, ~~[[said]]~~ the second member, or ~~[[said]]~~ the third member to achieve the selected final orientation with assistance of ~~[[said]]~~ the two or more icons; and

displaying ~~an additional~~ a current position icon relative to the two or more icons to illustrate ~~[[a]]~~ the current position of at least one of ~~[[said]]~~ the first member, ~~[[said]]~~ the second member, or ~~[[said]]~~ the third member ~~in a substantially patient imageless manner~~ relative to said selected final orientation without images acquire of a patient.

54. (Currently Amended) The method of claim 53, further comprising:

positioning the first member and the second member substantially at least one of percutaneously or minimally invasively ~~relative to a~~ into selected anatomical ~~portion~~ vertebrae; and

detecting a position of a navigational element fixedly connected ~~relative~~ to said first member and said second member to determine the position of the first member and the second member.

55. (Previously Presented) The method of claim 54, wherein said detector is selected from the group comprising an electromagnetic detector, an optical detector, a conductive detector, a fiber optic detector, an acoustic detector, and combinations thereof.

56. (Previously Presented) The method of claim 53, wherein at least one of the first member, the second member, or the third member is selected from a group including a fastener, a rod, an acetabular cup, a femoral component, a tibial component, a glenoid component, a bone plate, and combinations thereof.

57. (Original) The method of claim 53, wherein displaying a position includes forming a graphical representation of the determined position of the first member and the second member and displaying it in user readable format.

58. (Currently Amended) The method of claim 53, wherein selecting a characteristic of at least one of the first member, the second member or the third

member includes selecting a characteristic from a group including a length, a radius, a diameter, an offset, a flexibility, an alignment, and combinations thereof with at least an assistance of a processor by processing determined positions of the first member and the second member.

59. (Previously Presented) The method of claim 53, further comprising:
navigably positioning the third member including:

moving a substantially steerable catheter relative to the first member and the second member; and

displaying a real time position of at least a portion of the third member relative to the first member or and the second member.

60. (Previously Presented) The method of claim 53, wherein selecting the final orientation includes selecting at least one of an alignment in a first plane or an alignment in a second plane.

61. (Original) The method of claim 60, further comprising positioning a fourth member relative to the first member and the second member to assist in achieving the selected final orientation.

62. (Previously Presented) The method of claim 61, further comprising:
navigably positioning the third member including:

moving the third member relative to at least one of the first member, the second member, or the fourth member to substantially fix the construct in the selected final orientation.

63. (Original) The method of claim 53, further comprising:
obtaining a patient image to verify the positioning of the first member, the second member, and the third member in the selected final orientation.

64. (Previously Presented) The method of claim 53, further comprising:
selecting a pedicle screw for at least one of the first member, the second member, or the third member and a connector for at least one of another of the first member, the second member, or the third member.

65. (Previously Presented) The method of claim 64, wherein navigably positioning at least one of the first member, the second member, or the third member includes:

positioning at least a first screw relative to second screw to allow for interconnection in a selected alignment.

66. (Previously Presented) The method of claim 64, wherein navigably positioning at least one of the first member, the second member, or the third member includes:

displaying a movement of the connector relative to substantially only at least one of the screws.

67. - 77. (Canceled)

78. (Previously Presented) The system of claim 2, wherein said fastener includes a screw with a shank and an adjustable head operable to be positioned into a vertebra;

wherein said localization element is operable to be connected to said adjustable head;

wherein said processor is operable to determine a position of the adjustable head.

79. (Previously Presented) The system of claim 63, wherein said first member includes a screw with a shank and the adjustable head operable to be positioned into a vertebra;

wherein said tracking element is operable to be connected to said adjustable head;

wherein said processor is operable to determine a position of the adjustable head and display the first icon to illustrate the determined position of the adjustable head.

80. (Currently Amended) The system of Claim 7, wherein the first tracking element has a first shape and the second tracking element has a second shape different from said first shape such that said detector or said processor can uniquely identify each of said first pedicle screw member and said second elongated rod member.

81. (Currently Amended) The system of claim 1, wherein said processor is operable to track said first localization element fixed to said first pedicle screw member and said second localization element fixed to said second elongated rod member with six degrees of freedom.

82. (Currently Amended) The system of claim 1, wherein said first localization element engages with said first member and locks said first pedicle screw member in a selected position and a selected orientation.

83. (Canceled)

84. (Previously Presented) The system of claim 22, wherein said processor is operable to track the tracking element fixed to said first member with six degrees of freedom.

85. (Previously Presented) The system of claim 22, wherein the tracking element engages with said first member and locks said first member in a selected position and a selected orientation.

86. (Previously Presented) The system of claim 85, wherein said tracking element includes a depressible member coupled to a mechanism that selectively engages and disengages with said first member.

87. (Currently Amended) The method of claim 33, wherein [[the]] tracking [[step]] comprises tracking the first tracking element connected to the first member and the second tracking element connected to the second member with six degrees of freedom.

88. (Previously Presented) The system of claim 33, wherein said first tracking element engages with said first member and locks said first member in a selected position and a selected orientation.

89. (Previously Presented) The system of claim 88, wherein said first tracking element includes a depressible member coupled to a mechanism that selectively engages and disengages with said first member.

90. (Currently Amended) The method of claim 53, wherein [[the]] tracking [[step]] comprises tracking the position of the first member or the second member with six degrees of freedom.

91. – 93. (Canceled)

94. (New) The method of Claim 33, further comprising:

connecting a third tracking element to the third member to allow said navigating the third member;

wherein the first member is a first pedicle screw, the second member is a second pedicle screw, and the third member is an elongated rod moveable to interconnect the first pedicle screw and the second pedicle screw.

95. (New) The method of Claim 94, wherein connecting a tracking element includes depressing a member to actuate an internal mechanism to fixedly connect the tracking element to the first pedicle screw;

while the tracking element is fixedly connected to the first pedicle screw also tracking the second pedicle screw with a second tracking element fixedly connected to the second pedicle screw.

96. (New) The method of Claim 54, wherein the current position icon includes a progress bar illustrating the amount of progress of movement of the third member

relative to at least one of the first member or the second member based on the selected characteristic and said selected final orientation.

97. (New) A method of implanting a construct having at least a first pedicle screw member, a second pedicle screw member, and a third elongate rod member, the method comprising:

positioning the first pedicle screw member into a boney structure vertebra;

removably and fixedly connecting a first tracking element to the first pedicle screw member;

tracking a position of the first pedicle screw member in a selected space with the first tracking element connected to the first member;

positioning the second pedicle screw member relative to the first pedicle screw member in a second boney structure vertebra;

removably and fixedly connecting a second tracking element to the second pedicle screw member while maintaining connection of the first tracking element to the first pedicle screw member;

tracking a position of the second pedicle screw member in the selected space with a second tracking element connected to the second member;

determining an alignment in a first plane and an alignment in a second plane of the first pedicle screw member and the second pedicle screw member;

navigating the third elongated rod member relative to the first pedicle screw member and the second pedicle screw member, while tracking the first tracking element connected with the first pedicle screw member and tracking the second tracking element connected to the second pedicle screw member, including:

removably and fixedly connecting a third tracking element to the third elongate rod member while maintaining the connection of the first tracking element

to the first pedicle screw member and the second tracking element to the second pedicle screw member;

determining a characteristic of the third elongated rod member to achieve the determined alignment in the first plane and the second plane;

determining a real time position of the third elongated rod member relative to at least one of the first pedicle screw member or the second pedicle screw member with the respective connected first, second, and third tracking elements; and

displaying a first member icon, a second member icon, and a third member on a display to illustrate the determined real time position of the first pedicle screw member, the second pedicle screw member, and the third elongated rod member without displaying representations of the boney structure.

98. (New) The method of Claim 97, further comprising displaying an entry point icon indicating a point in space through which the tip of the third elongated member is to pass.

99. (New) The method of Claim 98, further comprising moving a navigable probe in contact with an external soft tissue of a patient to determine a contour of the external soft tissue of the patient.

100. (New) The method of Claim 99, further comprising:
displaying a progress icon to represent the real time progress of the third member relative to achieving the determined characteristic of the third member.

101. (New) The method of Claim 99, further comprising:

automatically determining an optimal characteristic with a processor of at least one of the first member, the second member or the third member including a length, a radius, a diameter, an offset, a flexibility, an alignment, and combinations thereof.

102. (New) The method of Claim 101, further comprising:

automatically determining with a processor the entry point through the external soft tissue to achieve the selected characteristic.

103. (New) The method of Claim 102, wherein the optimal characteristic can be determined in real time based on the tracked position of at least the first member, the second member or the third member.

104. (New) The method of Claim 102, further comprising:

removing all of the first tracking element, the second tracking element, and the third tracking element from the respective first pedicle screw member, the second pedicle screw member, and the third elongated rod member after navigating the third elongate rod member to achieve the selected alignment.